PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

PLANTERS' BULLETIN FORTY-ONE

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Price
50 Cents

March
1959

R R I

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OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur March 1959 Number 41

Editorial: Research and Efficiency

'Give us the tools and we will finish the job' is a slogan from World War II that is still valid. It is one way of expressing the opinion that if research can produce the new material and methods, industry can put them to the best possible use.

This is an oversimplification because in planting, as in any other form of agriculture, there are a large number of uncontrolled variables which can upset or even reverse the application of this dictum. To take the simplest case: it is a truism to say that under bad supervision the best planting material is of little more use than the worst, because high potential yields are only realisable under efficient management.

Efficiency is a measure of the overall factors which are combined in the running of a plantation. It requires constant attention to detail, and herein lies its greatest danger. Costs are one of the most important items in plantation management, and it is almost fatally easy to become immersed in costs to the exclusion of the main point of planting, that of growing and exploiting rubber trees in the most efficient way. Restricted expenditure is often used as a synonym for economy, whereas economy in this sense is often the converse of economic efficiency.

To be more specific, cheap methods of planting and maintaining immature areas and their reverse, overcultivation and unbalanced manuring, are not efficient. Money spent on efficient supervision is seldom wasted. The question of the degree of supervision to be provided is individual. Small amounts of money saved in trivial ways may lead to the expenditure or loss of large sums after the passage of years.

We contend, therefore, that for the health of the rubber producing industry, routine methods should be regularly reviewed and that time should be deliberately allotted to examining efficiency in general on plantations. In other more mechanised industries, special consultants are available for this purpose.

It is particularly interesting at this juncture to note that the International Labour Organisation Productivity Mission which visited Malaya in early 1958 has recommended the opening of a Productivity Centre in the country. When it first arrived, the Mission thought that its activities should be confined to industry and not extended to agricultural practice. During its stay in Malaya, however, the Mission revised its views and it is believed that if the final Productivity Centre is approved, it will include estate practice.

If such a Productivity Centre were set up it would provide an opportunity for improvement in a part of the rubber plantation industry which is at present outside the Institute's activities and for which additional technical staff would be needed. By means of the Centre's facilities the Industry would make more efficient use of the services and advice which the Institute can at present provide.

RRIM 600 Series Clones

THE FOURTH INTERIM REPORT is presented for a further year's tapping in the large scale trials of clones RRIM 600 to 618 and RRIM 619 to 630 at the Rubber Research Institute Experiment Station, the last reports having appeared in *Planters' Bulletin 34* and *36*.

RRIM 600–618

There are five plots of a third of an acre of each clone in this trial. Clones RRIM 501 and Tjir 1 are controls. The stand during the year under review was 125 trees per acre.

The results for the third year of tapping, which was completed in September, 1958, are shown in Tables 1 and 2, and all data are also expressed as percentages of RRIM 501.

Girth – The mean girth of all clones in October, 1957 was 22.8 inches, but became 23.2 inches after thinning out in that month. In October, 1958 the mean girth was 24.4 inches, the mean increment being 1.2 inches. (Table 1). The increment for different clones varied from 0.6 inches to 1.7 inches. The highest yielding clones (RRIM 613, 614 and 501) have the lowest girth increment.

Yield – As usual, yields are given both as yield per tree per tapping and as yield per acre per annum. (Table 2). Since in the third year of tapping practically all trees were in tapping, there is only a slight difference in rank between these two types of yield recording, except for clones which have suffered from wind damage.

The yield of clone RRIM 501 has increased from 1081 lb/acre in the second year of tapping to 1427 lb/acre in the third year. Yields of the other clones have increased only slightly, while the yield of RRIM 610 has dropped. Only RRIM 613 and RRIM 614 have yielded more than RRIM 501 in the third year of tapping. If however we consider the total yield over three years of tapping, clones RRIM 600, 603, 605 have also yielded more than RRIM 501. Although the yield of RRIM 612 continues to be disappointing, it is improving and in the third year of tapping equalled that of Tjir 1.

Bark Thickness – Of the promising clones only RRIM 610 shows renewed bark of below average thickness. The relatively poor bark renewal of RRIM 501 is confirmed.

TABLE 1. LARGE SCALE TRIAL OF CLONES RRIM 600–618 AT THE R.R.I. EXPERIMENT STATION

Girth and bark thickness

Clone	*Mean girth at 60 inches from the union*		*Girth increment in inches Oct.'57 –Oct.'58*	*Bark thickness in October '58*				*Wind damage cases in 3rd year of tapping*
	In inches in Oct. 1958	*As % of RRIM 501*		*Virgin bark in mm*	*As % of RRIM 501*	*Renewed bark 3rd year in mm*	*As % of RRIM 501*	
RRIM 600	25.1	111	1.7	7.9	104	6.8	126	–
RRIM 601	25.8	114	1.3	8.3	109	6.5	119	2
RRIM 602	25.9	114	1.6	8.4	110	8.2	151	–
RRIM 603	25.4	112	1.3	7.7	101	6.6	122	13
RRIM 604	25.5	112	1.6	8.2	108	6.3	117	–
RRIM 605	24.4	108	1.2	8.1	108	6.7	123	–
RRIM 606	25.3	112	1.1	7.7	100	6.5	120	–
RRIM 607	25.4	112	1.2	7.8	102	6.6	122	–
RRIM 608	22.7	100	0.8	8.2	108	6.6	122	4
RRIM 609	24.6	108	1.6	9.3	122	7.3	135	–
RRIM 610	23.5	104	0.9	7.6	100	5.8	107	–
RRIM 611	23.8	105	1.3	7.0	92	5.3	98	–
RRIM 612	26.8	118	1.5	8.2	107	6.5	120	–
RRIM 613	23.7	104	0.6	7.9	103	5.9	109	77
RRIM 614	24.3	107	0.8	8.9	116	6.8	125	70
RRIM 615	23.2	102	1.0	7.7	101	6.0	110	1
RRIM 616	23.9	105	1.2	7.1	93	5.6	103	15
RRIM 617	23.5	104	1.4	8.7	114	6.1	112	2
RRIM 618	21.8	96	0.7	8.0	104	5.9	108	1
Tjir 1	25.7	113	1.4	7.5	99	6.5	119	3
RRIM 501	22.7	100	0.9	7.6	100	5.4	100	–
Mean	24.4	107	1.2	8.0	105	6.4	118	

Wind Damage – During the first two years of tapping there have been few cases of wind damage in this trial. However in other trials clones RRIM 613 and 616 suffered heavily and clone RRIM 614 in some trials also showed some liability to wind damage. During the third year of tapping, some unexpected severe wind damage was experienced, about 30 per cent of the trees of clones RRIM 613 and 614 having to be cut out, as they were damaged beyond recovery, mainly by trunk-snap. These two clones have been deleted from our present list of promising 600 series clones, although they are the highest yielding ones.

RRIM 619–630

There are four plots of one third of an acre for each clone in this trial. RRIM 501 is the control. Results are given in Tables 3 and 4 for the second year of tapping, which was completed in June, 1958, and the stand during the first three months was 140 trees per acre but was brought down to 130 trees per acre in October, 1957.

TABLE 2. LARGE SCALE TRIAL OF CLONES RRIM 600–618 AT THE R.R.I. EXPERIMENT STATION

Yield

Clone	Parentage	Mean yield in third year of tapping				Mean yield over three years of tapping				Brown bast cases in 3rd year of tapping
		Per tree per tapping		Per acre per annum		Per tree per tapping		Per acre per annum		
		Grams	As % of RRIM 501	lb	As % of RRIM 501	Grams	As % of RRIM 501	lb	As % of RRIM 501	
RRIM 600	Tjir 1 × PB 86	31.8	98	1399	98	28.4	98	1034	108	–
RRIM 601	Tjir 1 × Gl 1	25.1	78	1098	77	21.4	74	817	85	1
RRIM 602	Tjir 1 × Gl 1	24.0	74	1064	75	18.7	64	734	77	1
RRIM 603	PB 86 × Pil B84	29.7	92	1293	91	27.2	93	1002	105	3
RRIM 604	Tjir 1 × PB 49	22.2	69	975	68	22.9	79	745	78	1
RRIM 605	Tjir 1 × PB 49	32.1	99	1412	99	30.8	106	1148	120	–
RRIM 606	Tjir 1 × PB 49	25.7	80	1147	80	23.8	82	903	94	–
RRIM 607	Tjir 1 × PB 49	25.0	77	1112	78	24.0	82	904	95	–
RRIM 608	AVROS 33 × Tjir 1	19.1	59	771	54	19.0	65	557	58	–
RRIM 609	AVROS 157 × BD 5	25.6	79	1125	79	24.5	84	733	77	1
RRIM 610	RRIM 504 × Tjir 1	22.5	70	1018	71	27.2	93	911	95	2
RRIM 611	RRIM 504 × Tjir 1	22.9	71	1028	72	22.2	76	767	80	1
RRIM 612	AVROS 157 × PB 49	18.2	56	814	57	15.1	52	600	63	1
RRIM 613	Tjir 1 × RRIM 509	45.1	140	1581	111	37.7	130	1359	142	2
RRIM 614	Tjir 1 × RRIM 509	46.6	144	1712	120	41.7	143	1375	144	2
RRIM 615	RRIM 511 × Tjir 1	17.4	54	738	52	15.0	52	517	54	–
RRIM 616	Tjir 1 × RRIM 507	31.9	99	1246	87	28.6	98	949	99	1
RRIM 617	BR 2 × RRIM 500	21.7	67	933	65	23.3	80	672	70	1
RRIM 618	Lun N × RRIM 501	21.5	67	861	60	21.8	75	612	64	–
Tjir 1	—	19.5	60	815	57	20.0	69	705	74	1
RRIM 501	Pil A44 × Lun N	32.3	100	1427	100	29.1	100	956	100	3
Mean		26.7	83	1122	79	24.9	86	857	90	

TABLE 3. LARGE SCALE TRIAL OF CLONES RRIM 619–630 AT THE R.R.I. EXPERIMENT STATION

Girth and bark thickness

Clone	*Mean girth at 60 inches from the union*		*Girth increment in inches Oct. '57 – Oct. '58*	*Bark thickness in October '58*				*Wind damage cases in 2nd year of tapping*
	In inches in Oct. 1958	*As % of RRIM 501*		*Virgin bark in mm*	*As % of RRIM 501*	*Renewed bark 2nd year in mm*	*As % of RRIM 501*	
RRIM 619	22.5	104	1.4	7.8	100	5.9	102	10
RRIM 620	22.8	106	1.3	8.2	105	6.3	109	–
RRIM 621	23.1	107	1.0	8.1	104	6.1	105	3
RRIM 622	22.0	102	1.3	6.8	87	5.8	100	–
RRIM 623	24.9	115	1.5	6.9	88	5.1	88	–
RRIM 624	20.4	94	0.8	7.0	90	5.6	97	–
RRIM 625	24.6	114	1.1	6.5	83	5.3	91	1
RRIM 626	21.3	98	1.3	8.6	110	6.8	117	–
RRIM 627	23.1	107	1.0	6.3	81	4.9	84	2
RRIM 628	21.5	99	0.9	7.8	100	6.0	103	1
RRIM 629	21.0	97	1.2	7.1	91	5.7	98	–
RRIM 630	21.1	98	1.3	8.9	114	7.6	131	–
RRIM 501	21.6	100	0.8	7.8	100	5.8	100	–
Mean	22.3	103	1.2	7.5	96	5.9	102	

Girth – The mean girth increment during the second year of tapping was 1.2 inches. RRIM 623 had the highest increment, RRIM 501 one of the lowest.

Yield – The highest yielders in the second year of tapping were RRIM 628, 623 and 621. The yield of RRIM 628 is unusually high but in various estate trials its vigour is below average, while in one particular trial the trees are leaning. The performance of this clone will have to be confirmed in other trials before we can add it to the list of promising clones.

Bark Thickness – Virgin and renewed bark of RRIM 623 are rather thin. Clones RRIM 621 and 628 show an average thickness of virgin and renewed bark.

Wind Damage – Clones RRIM 619 and 621 developed a few broken trees in the trial under review. Valuable information on liability to wind damage comes from a trial in a very exposed coastal area, where clones RRIM 621, 622, 624 and 626 were heavily damaged; few trees of RRIM 628 showed wind damage, while RRIM 623 was the only clone without any damage.

Characteristics of the Product – Some information on the suitability for crepe production and concentration of the latices of clones RRIM 600 – 618 was published in *Planters' Bulletin 36*, page 68. Latices of

TABLE 4. LARGE SCALE TRIAL OF CLONES RRIM 619-630 AT THE R.R.I. EXPERIMENT STATION

Yield

Clone	*Parentage*	*Mean yield in second year of tapping*				*Mean yield over two years of tapping*				*Brown bast cases in 2nd year of tapping*
		Per tree per tapping		*Per acre per annum*		*Per tree per tapping*		*Per acre per annum*		
		Grams	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	*Grams*	*As % of RRIM 501*	*lb*	*As % of RRIM 501*	
RRIM 619	RRIM 501 × Tjir 1	20.9	78	939	81	18.6	75	707	80	3
RRIM 620	RRIM 501 × RRIM 511	23.5	88	1100	95	20.6	83	843	95	–
RRIM 621	RRIM 504 × Tjir 1	30.0	112	1543	133	25.5	103	1210	137	2
RRIM 622	Tjir 1 × Pil B84	18.6	70	699	60	20.7	84	674	76	–
RRIM 623	PB 49 × Pil B84	31.1	116	1624	140	27.7	112	1372	155	1
RRIM 624	Tjir 1 × RRIM 529	27.7	104	917	79	30.1	121	687	78	2
RRIM 625	Tjir 1 × RRIM 526	23.8	89	1180	102	22.0	89	1009	114	2
RRIM 626	Tjir 1 × RRIM 500	27.7	104	1080	93	29.9	121	781	88	1
RRIM 627	Tjir 1 × RRIM 526	20.8	78	1031	89	20.6	83	866	98	4
RRIM 628	Tjir 1 × RRIM 527	42.9	161	1826	157	37.7	152	1326	150	1
RRIM 629	Tjir 1 × RRIM 529	22.4	84	829	71	21.9	88	625	71	–
RRIM 630	Tjir 1 × RRIM 527	22.8	85	917	79	22.0	89	623	71	1
RRIM 501	Pil A44 × Lun N	26.7	100	1162	100	24.0	100	884	100	2
Mean		26.1	98	1142	98	24.8	100	893	101	

clones RRIM 619 – 630 have now been tested, and the results are summarised in Table 5.

TABLE 5. CHARACTERISTICS OF THE PRODUCT FROM CLONES RRIM 619 – 630

Clone	*Pale crepe*			*Suitability of latex for concentration*
	Colour	*Hardness*	*Suitability*	
RRIM 619	yellow	soft	–	*
RRIM 620	white	soft	* *	* *
RRIM 621	white	soft	* *	*
RRIM 622	white	hard	* * *	*
RRIM 623	light yellow	hard	* *	* *
RRIM 624	light yellow	hard	* *	* *
RRIM 625	light yellow	hard	* *	* *
RRIM 626	white	hard	* * *	*
RRIM 627	light yellow	hard	* *	*
RRIM 628	light yellow	hard	* *	* *
RRIM 629	deep yellow	hard	–	* *
RRIM 630	light yellow	hard	* *	* *
RRIM 501	light yellow	soft	*	* *

The classification of suitability for pale crepe production is based on colour and hardness of the crepe, using the following symbols:

*** suitable

** will need fractionating or bleaching

* will need maximum fractionating or bleaching

– unsuitable

Our judgement of suitability for concentration is based on the mechanical stability of the latex after storage for one and three months. The interpretation of the classification is as follows:

** suitable for concentration on all sites

* marginal: latices which may give difficulties on particular sites

– unsuitable: only very limited addition of latex of these clones to other field latex could be permitted.

PROMISING CLONES

The list of the most promising 600 series clones given in the article 'Planting Recommendations 1959 – 60' *Planters' Bulletin 40* has not been altered for the present. It contains clones 600, 603, 605, 606, 607, 610 and 623, and will be reviewed in a year's time when further data will be available from the R.R.I. Experiment Station and from estate trials recently brought into tapping.

Rock Phosphate versus Superphosphate

THE R.R.I. USUALLY ADVISES that Christmas Island rock phosphate and superphosphate are about equal in their efficiency as phosphate fertilisers for rubber. Since the cost per unit of phosphate (P_2O_5) derived from rock phosphate is rather less than half that from superphosphate, it follows that the former is a better economic proposition for manuring rubber trees and ground covers. From time to time, however, this dictum is questioned and this article explains why the advice is given and considers the possible reasons for questioning it.

It will be useful to consider first the main differences between the two fertilisers. As its name implies, Christmas Island Rock Phosphate is obtained from mineral deposits on Christmas Island and the only preparation it receives for use as a fertiliser is the reduction of its particle size to that of a fine powder, since this has been found to increase its efficiency. Superphosphate is manufactured from rock phosphate by acid treatment, which produces a different chemical compound. As a result superphosphate is a distinctly acid substance, a fact which may be noticed in a practical way from its tendency to rot bags, particularly if they have been wetted; in it, broadly speaking, lime and phosphate are combined in the ratio of 1 to 2, giving a compound which is completely soluble in water. On the other hand, rock phosphate is a neutral substance in which lime and phosphate are combined in the ratio of 5 to 3, giving a compound which is nearly insoluble in water but rather more soluble in the acid soil solution, particularly when it is present as a fine powder.

As a result of these differences, the behaviour of the two fertilisers in the soil is quite different. In neutral or only slightly acidic soils, superphosphate remains in a highly available condition for plant growth, because in such soils phosphate occurs almost entirely as a soluble calcium compound. In acidic soils, however, iron and aluminium are able to form compounds with phosphate which are relatively insoluble and far less available for plant growth. This effect which is often termed 'phosphate fixation', increases as soils become more strongly acid.

Rock phosphate, because of its insolubility, is not immediately available to plants and is, therefore, less capable of supplying heavy phosphate demands from crops growing in neutral soils. In acidic soils, however, it releases its phosphate slowly, and gives a steady supply to nearby plant roots which they can use before the 'fixation' process sets in. As a consequence of the difference in composition referred to above, rock phosphate also supplies more lime to the soil than superphosphate, when equivalent applications of phosphate are made, and in soils poorly supplied with lime this should be of some importance, although it will be a long term effect.

Against the background of what has been said about the properties and behaviour of the two fertilisers, we will now consider them in the light of agricultural practice and experience in temperate countries,

from which it is felt, stems much of the argument in favour of superphosphate. Under such conditions it is true that superphosphate usually proves sufficiently superior to offset its extra cost, and the results of manurial trials confirm this, in particular for arable crops grown on neutral or slightly acidic soils where rainfall is comparatively low. It must be remembered that in these soils a high level of fertility is maintained, with acidity corrected where necessary by liming, since most of these crops are intolerant of the degree of acidity usually found in Malaya. For such soils and crops a fertiliser must be able to supply phosphate rapidly to keep pace with plant growth and this favours superphosphate because it is soluble in the soil solution.

On less productive, acidic soils, such as those found in the north-western parts of Wales and Scotland, where rainfall is higher, rock phosphate is frequently as effective as superphosphate. In such soils fixation of phosphate by iron and aluminium takes place, so that, as explained previously, the advantage of solubility in the fertiliser is largely lost.

In Malaya the effective rainfall is higher and the soils are considerably more acidic than those in agricultural use in temperate countries, the red colour of the soils testifying that they contain iron and aluminium compounds which will reduce the solubility of phosphate. As may be expected, therefore, no convincing evidence for the superiority of superphosphate over rock phosphate has been obtained, either from field observations over many years in rubber plantations or from the results of manurial trials, carried out on hevea on different soil types, in which the two fertilisers have been compared.

A few experiments will now be briefly mentioned which support the application to Malayan conditions of the theories, given above. In one experiment soluble phosphate was added to the soil and it was found that no more than 12% succeeded in penetrating beyond three inches, while 50% was retained in the first half inch, because it was fixed on coming into contact with soil particles. Phosphate taken up by plants from soil to which superphosphate had been added in one instance and rock phosphate in the other, was also measured. The result though slightly in favour of superphosphate was for practical purposes the same for both. In another experiment rock phosphate and superphosphate were applied to rubber at the time of planting in the planting hole, and subsequently as surface dressings. The heights of the plants were taken after 3 months and after 6 months, and later, girths of the trees were measured, but no differences were detected which could be attributed to the fertilisers. These experiments demonstrate that although superphosphate, as applied to the soil, is a highly available form of phosphate, conditions in Malaya substantially reduce its solubility by means of what is termed phosphate fixation and hence its ability to penetrate into the soil. As a result rubber, both in the early and the later stages of growth, can make no better use of it than of

rock phosphate, although the latter is not considered to be readily available.

It may then be asked whether there are any conditions under which superphosphate could be recommended in preference to rock phosphate. It follows from what has already been said that on neutral or slightly acidic soils (i.e. with pH values above 6) superphosphate might prove sufficiently superior to rock phosphate to justify its extra cost. Such conditions are seldom found in Malaya except in soils derived from limestone, also in some coastal soils containing calciferous shells and occasionally in old building sites. Although little evidence exists in support of the view, it is reasonable to expect that under special conditions superphosphate may be recommended for use in rubber plantations. These occur when a state of phosphate deficiency in the plant has been definitely established and where a rapid corrective is needed in a period of dry weather. In these circumstances, superphosphate applied to the surface soil possibly has a better chance than rock phosphate of penetrating quickly to the surface roots, although a substantial portion of the application would be rendered insoluble by the soil fixation process.

In conclusion we would reiterate that while soil conditions remain strongly acid in rubber plantations (and it would probably be prohibitively expensive to try and change them by liming) rock phosphate is likely to remain as effective as superphosphate. In areas where calcium deficiency is developing (and such areas may be expected to develop in the strongly leached Malayan soils) rock phosphate may in the long run prove superior because it contains more calcium than superphosphate.

Fire Damage and Borers

ALTHOUGH BORING BEETLES INVADE ANY dead hevea wood sooner or later, and are commonly found in poisoned and lightning – damaged trees, they are specially attracted to trees damaged by fire. In fact, it had been accepted in the past that boring beetles were the cause of death of trees injured by fire, and methods used to combat its effects were aimed at excluding borers. This view has now to be modified as it is apparent that only those parts of a tree which are severely enough burnt to cause their death, are attractive to borers.

Most of the boring beetles recorded on rubber belong to the families Scolytidae and the closely related Platypodidae and to one of two genera, *Xyleborus* and *Platypus*. These beetles are elongated cylindrical insects ranging in length from about one millimeter to about one centimeter and are a sombre black colour. The name pinhole or shothole borer is often applied depending on the size of hole made in the wood.

The damage caused by borers is most characteristic and the tunnels which they make, hardly larger than the body cross section, may penetrate even into the heartwood of a tree. The borings are perfectly round as the beetles have the habit of rotating as they bore and the workings follow a pattern characteristic of the species.

Only in exceptional circumstances will borers attack living wood, and then usually after a temporary reduction in vitality associated with some passing unfavourable condition. Injured tapping panels have been attacked and also the wood exposed by bad tapping.

As borers are not directly responsible for bringing about the death of trees damaged by fire, it is not necessary to concentrate treatment towards their exclusion—a situation which is almost impossible to achieve when dealing with fire-damaged trees—and treatment should, in the first place, have for its aim the protection of the trunk from further damage by heat from the sun following loss of canopy, and by fungal attack, and secondly, to encourage bark renewal where the trees are not killed.

TREATMENT OF FIRE DAMAGE

While severely damaged trees will show the effect immediately, the full extent of damage may not be known for a period of three to four weeks after the outbreak. It is, therefore, advised that all trees in the area are immediately painted with a mixture of whitewash to which is added a water - miscible tar acid fungicide, of the type approved for the control of mouldy rot (*Planters' Bulletin 25* page 69). The fungicide should be used at the highest recommended concentration. This treatment will prevent sunscorch to stems suddenly exposed through loss of canopy and help to control growth of saprophytic fungi on the decaying bark. No other treatment is required at this stage.

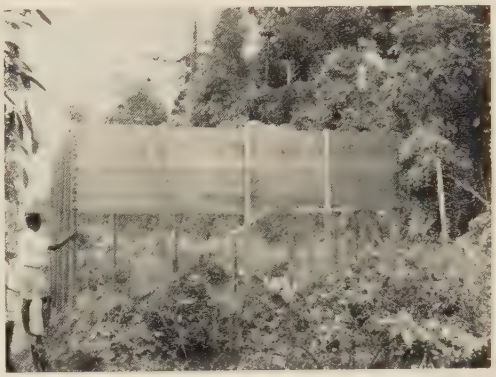
After a lapse of three to four weeks trees which will die should be obvious and the full extent of wounding on others discernible. There will also be at least a light shade to protect the wounds which are to be treated.

The next stage of treatment consists of removing the dead bark, which will by now be loose, and treating the resulting wound with any of the fungicides in the list referred to above. No attempt should be made to excise wood invaded by borers or which is discoloured. When the fungicide has dried, the edges of the wounds, from which bark renewal will take place, should be given a light application of a petrolatum, such a Standard Vacuum Product 2295-C or Shell Otina C. This may require renewing after a period of six months. The exposed wood can be given a dressing of a bitumen wound paint, (e.g. asphalt kerosene mixture - *Planters' Bulletin 17* page 28) but this should not come in contact with callus tissue to which the petrolatum is applied.

The advice given here on treatment of fire damage supersedes that given in *Planters' Bulletin 17* under 'Wounds and their Treatment'.

Warm-Blooded Animals

NEW CLEARINGS, ESPECIALLY THOSE bordering jungle or belukar, and even replantings and nurseries containing young seedlings, are exposed to occasional ravages of a number of warm-blooded animals, ranging from the elephant to the rat. Most of these animals have their home in the jungle and enter cultivated areas only exceptionally, but a few, such as rats and some species of squirrels, are permanent inhabitants of cultivated areas. In rubber plantations the cover provides the necessary shelter for them.



Monkey trap at R.R.I. Experiment Station, Sungei Buloh.

Though specimens are frequently received from estates showing different types of damage our knowledge of the identity of the culprit is by no means complete. It is difficult to make direct observations of a pest out on the jungle edges particularly at night where a nocturnal pest is concerned. The problem is further complicated in that when damage is believed, for example, to have been done by squirrels or porcupines there are several species and each may leave different characteristics. This article sets out what we know on the subject, collected mainly from our advisory correspondence, and makes general recommendations on control of the various groups of pests.

Against the majority of the larger animals which have their normal habitation in the jungle, a permanent fence is the most effective method of protection but the expenditure involved in erecting a useful one is heavy. Electric fencing, a cheap alternative which was developed for enclosing domestic animals, has sometimes given poor results when tried for excluding wild animals and is difficult to maintain on jungle boundaries. It has been claimed, however, to work successfully against elephants. An article on electric fencing appeared in *Planters' Bulletin 3* on page 67. For other pests alternative methods of protection are usually adopted.

Elephants – Elephants cause damage in young plantations usually by trampling and partly through their apparent wanton habit of breaking plants off.

Prior to the war it was a common practice to leave an 'elephant belt' of one chain of felled, but uncleared, jungle round the boundaries of a clearing to prevent the elephants from entering the rubber. Fencing is now generally resorted to where elephants are prevalent.

Monkeys – Monkeys may damage rubber wantonly by breaking off branches and tearing leaves. Some of them will also eat the seed pods, bud shoots and young leaves, the leaves being usually bitten through, part being left undamaged.

Shooting is considered the best control and if the carcasses are hung up in the area they will act as the best deterrent to the rest of the troupe. Monkeys can also be trapped in a large cage of the enclosure type, constructed out of wire-netting and planks, which is provided with a seesaw device within that prevents their escape. Another method that has been suggested, is to smear the brown bark of perimeter trees, in immature areas, with a tanglefoot preparation which would stick to their fur. It has also been reported that monkeys can be frightened away by trapping one of them alive, sewing a piece of bright cloth around its body, and then releasing it.

Deer — Deer produce a most characteristic form of damage by stripping bark from trees from a short distance above ground level to about five feet. They may also eat the tops of small plants. Trees completely ring-barked may recover, but growth is usually poor and the renewed bark is rough. More often than not, especially if the trees have heavy crowns, the trunk breaks off before bark renewal is complete. Where the damage is not so severe, trees can usually be saved and a light application of a petrolatum will hasten bark renewal.

Without fencing, protection of plants in areas prone to incursions of deer is not easy, but the erection of a deer proof fence, which must be at least five feet high, is rarely an economic proposition. The alternative is to attempt to discourage them from eating the bark by the application of a repellent substance. A number of materials which have been recommended from temperate countries, applied either directly to the bark or to pieces of sacking hung around in the area, have not succeeded in repelling deer in this country. Encouraging results have been claimed following the application of an aluminium paint band two to three feet wide round the tree. Also black tar spots on the bark, later alternated with white spots, have been claimed to give some protection. In our examination of a number of repellents the only one which gave any indication of promise was a black bitumen emulsion (Shell Flintcote) when applied from ground level to the height of the lower branches. We believe the success comes purely from the colour. Gamescarers, which give intermittent explosions, are fairly successful against deer.

Wild pigs – These animals tear stumps and seedlings out of the ground and feed on the roots. They may also occasionally damage seedlings when rooting for grubs and rubber seeds. Where shooting is not carried out the usual method of control is by poisoning, using sodium arsenite baits. As this is a dangerous poison, strict adherence to safety precautions is important. Tapioca root, sweet potato or any other food to which wild pigs are partial may be used for preparing the baits.

Rats, Squirrels and Porcupines – These are all rodents and often cause considerable damage in nurseries and young plantings.

Rats and squirrels operate all over the country, and are most numerous near oil palm and coconut plantations. They thrive abundantly in clearings where felled timber has been stacked and left to decay on the ground. In coastal areas rats can be troublesome in replantings. Porcupines, on the other hand, come from the jungle and uncleared ravines.

Germination beds and seedling nurseries are often the scene of concentrated attacks by rats or squirrels, the seed kernels and the very young shoots being entirely consumed. Rats usually consume the seed on the spot while squirrels carry it away to eat and this fact gives a clue to the identity of the pest. Where young seedlings are attacked, the distinction is not so easily recognised and it may not be possible to pin-point the culprit without additional evidence. The seedling may be bitten off a few inches above ground level and the stem of the upper portion split to expose the pith which is consumed. Stems of older seedlings may only be partly cut across, the cut half split from the rest of the seedling upwards or downwards, so that the pith can be eaten.

The damage caused by porcupines is still obscure and we have never obtained undisputable evidence that obliquely severed stems in young seedlings are the work of porcupine, although there is some evidence to suggest that this may be so.

All three pests have been known to gnaw bark at the base of younger seedlings and buddings. Squirrels will also nibble the cortical tissues of small branches and even the renewing bark on the panel.

Before control measures are attempted it is desirable to determine the identity of the culprit and to this end traps should be set. Dried fish heads or prawns are attractive baits for rats; fruit or rubber seed for squirrels and salty bacon for porcupines.

If damage is not extensive trapping alone may suffice to dispose of the pest. Many protective devices, such as guards made of pieces of split bamboo or wire-netting of small mesh and tin cylinders have been tried. Where damage is extensive the most practical procedure would seem to be the application of a protective dressing, such as zinc phosphide and coconut oil in a 50:50 mixture by weight, or a tanglefoot preparation which can be obtained as a ready made mixture or made by taking four parts of raw linseed oil, boiling until thick and tacky, and then adding one part of castor oil and one part of powdered damar resin.

These dressings are liable to scorch green bark and should therefore be applied to paper guards wrapped round the stem when used on very young seedlings. When applied to brown bark no damage will result unless zinc phosphide is applied too thickly. All that is required is a very light smear to the basal few inches of the brown wood on seedlings or stumps. Seeds may also be treated as long as the application is made to half the seed only, furthest from the micropile.

The above dressings are usually considered as deterrents and a convenient way of disposing of these pests is by poison baiting. A number of materials have been used, such as thallium sulphate, sodium arsenite, white arsenic, barium carbonate and zinc phosphide, but with limited success. Recently a kind of poison which has the merit of eliminating bait shyness – the reason for the failure of most poisons – has been discovered, warfarin being the one that is locally available under the trade names of Warfarin 5K and Sorexa. These are concentrates, to be mixed with nineteen parts by weight of some acceptable food.

Tree shrews – The tree shrew has been recorded attacking young buddings and the damage is characterised by pin-pricks exuding latex on the developing budshoot and by the young shoot being cut through and partially consumed.

If trapping is resorted to in controlling tree shrews, fruit provides a suitable bait. Protective measures, as discussed under rats, squirrels and porcupines, can be successfully applied to control this pest also.

A characteristic type of spiral incision on the bark of young trees, described as 'Suspected Bird Damage' in *Planters' Bulletin 3,* may be referred to here. Since this article was published, several more cases of this type of damage have been reported and varying views expressed as to the cause. One view was that tree shrews were responsible but we have no evidence for altering our views.

Fruit Bats and Flying Foxes – Occasionally fruit bats and flying foxes feed on hevea leaves; and oddly enough, confine their attentions to the one clone Glenshiel 1, other contiguous clones being left untouched. They generally choose the outermost leaves, which are torn off and eaten. Chewed 'quids' composed of the veins and midribs, spat out after the soft parts have been consumed, are frequently seen under affected trees. There is a record of damage so severe that some trees were completely defoliated with only the tattered portions of the leaves remaining on the stalks. Although control measures have not been tested in this country, trapping by means of large nets suspended above the trees has been reported to be successful in Ceylon where such attacks are less uncommon.

Planting Material for Sale

We frequently receive requests for information concerning the availability and price of budwood and budded stumps of non-proprietary clones. We therefore ask companies and managers who have planting material for sale, other than clonal seed, to let us know what is available so that we can pass on the information.

Enquirers will be given the addresses of the suppliers nearest to them.

The R. R. I. could not accept responsibility for the identity of planting material sold under these circumstances.

Direction and Slope of Tapping Cut

AN INCREASING NUMBER OF ENQUIRIES make it desirable to summarise available information on this subject.

In an experiment carried out in Indonesia over thirty years ago a comparison was made between clockwise and anti-clock-wise half spiral cuts tapped on a daily periodic system. Two different slopes (25° and 45° from the horizontal) were confounded with these two treatments. The results of the experiment have been published by Dr J.G.J.A. Maas in the *Archief voor de Rubbercultuur* 9 (1925) 74 – 76.

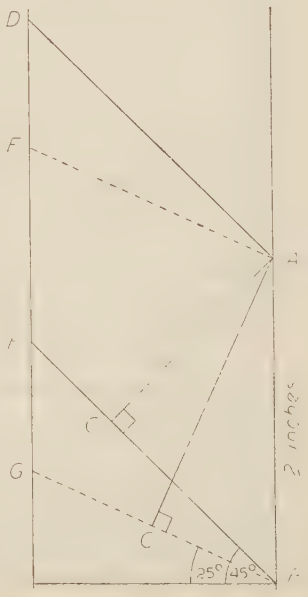
A later experiment has been carried out by the Rubber Research Institute of Malaya in which half spiral cuts sloping from left to right and from right to left were compared on buddings of clone Pil B95, and in a similar experiment comparison was also made between spiral and half circumference V cuts. A summary of the results of these experiments can be found on page 63 of the annual *Report* for 1936 of the Rubber Research Institute of Malaya.

All the experiments showed the superiority of the cuts sloping from left to right, the advantage becoming less marked as tapping progressed and current practice on all estates is to use left to right sloping cuts.

The problem of steepness of the slope of tapping cuts is more complicated and we shall limit ourselves to consideration of left to right tapping in which slopes of 25° and 45° have been compared.

Because latex vessels spiral around the tree at an inclination of some 3.5° from the vertical in a counter clockwise direction, it follows that a 45° sloping cut will sever more latex vessels than a 25° sloping cut, and hence a better yield should result from tapping a cut sloping at 45°.

In the experiment carried out in Indonesia the bark consumption, as measured along the axis of the trees, was maintained at two inches per month on daily tapping for both the 25° and 45° sloping cuts, and the actual thickness of bark removed by each tapping, as measured perpendicular to the cut, was less for the cut tapped at 45° than for the cut tapped at 25°. This is shown in the diagram, where AC and AC_1 represent the monthly thickness of shavings removed by the 25° sloping cut and by the 45° sloping cut respectively.



The thicker shavings removed when tapping at 25° (2 inches is about the optimum consumption on daily tapping) resulted in a yield which was 19% higher than that with the thinner shavings from the 45° sloping cuts.

It was also demonstrated in the same experiment that if the actual thicknesses of shavings are similar, as measured perpendicularly to the tapping cut, the cuts sloping at 45° yielded some 3.5% higher than the 25° sloping cuts.

In practice we would expect little difference between the thicknesses of bark shavings when tapping at 25° or 45° from the horizontal. This gives a heavier bark consumption for the steeper cut and a slightly better yield. This is more than offset by the increased bark consumption and the larger area of bark lost for tapping when the cuts reach ground level.

In *Planters' Bulletin 9* page 117, we recommend the angle of slope of the cut should be 25° from the horizontal, which is for seedling trees, where the presence of a thick cork layer in the bark provides a wide channel for the flow of latex. For budded trees, in which the total bark thickness is less than in seedlings, the latex may overflow the sides of a tapping cut with a 25° slope, and for this reason an angle of slope of 30° from the horizontal is recommended, which has proved satisfactory in our trials.

Insulation of Tunnel Driers

IN THE PAST THE WALLS OF TUNNEL driers have normally been built of brick, or plank with an asbestos cement lining. This type of construction is considered adequate when cheap firewood is available for fuel, since the cost of additional heat insulation is not justified by the small reduction in fuel costs. In instances where firewood is in short supply, or air dried rather than smoked products are required, oil fuel has been introduced for heating. (*Planters' Bulletin 35* page 42). Experience with oil fired driers of conventional construction has been favourable, but since the cost of the fuel is high it is desirable to consider different types of construction which give better heat insulation. Many people in the industry are interested in this aspect of drier design at the present time and this note is an assessment of the present position.

COST OF HEAT

An average cost for firewood is about $3 per cubic yard although local conditions will cause quite a wide variation in the price. The heating value of one cubic yard of firewood is about 5,500,000 British thermal units (B.th.u.) and thus each 1,000 B.th.u. costs about 0.06 cents. The fuel cost for obtaining 1,000 B.th.u. from say a distillate fuel in an efficient oil burner unit is about 0.42 cents – seven times as much as for firewood.

UTILISATION OF HEAT

The cost of drying sheet in a well designed and operated oil fired drying tunnel is not however seven times as expensive as in a smokehouse

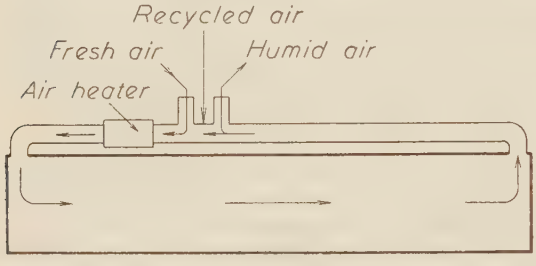
since the utilisation of the heat in drying the rubber is more efficient due partly to the increased ease of maintaining the required temperature and air flow. When hot air passes down the length of a drying tunnel its temperature drops progressively due to its heat being used in:

a heating the wet rubber and trucks to the required temperature;

b providing heat for evaporating the water;

c overcoming losses of heat from the walls, roof and doors.

Having passed through the tunnel, part of the air is recycled and part is discharged. Fresh air is then drawn in to replace the air which has been discharged. This is shown diagrammatically in the *Figure*.



Path of air flow in tunnel drier.

The load on the air heater consists of heating the fresh air and the recycled air to the correct temperature. If the losses from the walls are reduced the temperature of the recycled air will be higher and thus there will be less load on the heater.

The following Table shows the approximate amounts of heat involved and the costs, for a drier with an output of 4,000 lb dry sheet rubber per day, working at a hot end temperature of 140°F, and having a single brick wall, wooden doors, and a corrugated iron roof with an asbestos ceiling:

	B.th.u./day	*cent/lb*
Heat to fresh air	2.5×10^6	0.25
Heat to recirculated air		
– depending on losses	1.5×10^6	0.15
– depending on evaporation etc.	1.5×10^6	0.15
	5.5×10^6	0.55

The losses account for 0.15 cent/lb. For the drying of blanket crepes at say 120°F and of thin crepes at say 100°F the figures are about 0.11 cent/lb and 0.05 cent/lb respectively. The aim is to reduce these by improving the insulation.

INSULATION

The effectiveness of a particular type of construction as a heat insulator is usually expressed by means of a resistance to heat flow, 'R'. A high value of R means that less heat will flow through the wall. The overall value of R is derived by adding R values of the individual components

of the wall. For instance in the case of a single brick wall the total resistance is equal to the sum of the resistances of an air film inside the building, the brick itself, and an outer air film.

R for two air films	=	1.1
R for 4½ inches brick	=	0.75
Total	=	1.85

The Table gives approximate R values for some common types and thicknesses of material.

R values (sq. ft hr deg. F/B.th.u.)

Description	*Thickness in inches*	*R*
Brick	4½	0.75
	9	1.5
Wood	¾	0.75
Asbestos cement	5/32	0.08
Wood wool building block	2	4.4
	4	8.8
Glass fibre blanket	1	4.0
	2	8.0
Exfoliated vermiculite	4	8.0
Inside and outside air films	–	1.1
Air cavity	–	0.7

Using these values the resistances for various types of construction can be derived.

Description	*Individual components*	*Total R*
Plank and asbestos with cavity	1.1 + 0.75 + 0.7 + 0.08	2.63
Single brick	1.1 + 0.75	1.85
Double brick	1.1 + 1.5	2.60
Double brick with cavity	1.1 + 1.5 + 0.7	3.30
4 inches wood wool building blocks rendered	1.1 + 8.8 + 0.15	10.05
Single brick with 2 inches glass fibre blanket, cavity, and asbestos cement covering	1.85 + 8.0 + 0.7 + 0.08	10.63

It should be emphasised that the values in this and the preceding section are not values which we ourselves have determined experimentally, but follow from design calculations. It is however known that they are in reasonable agreement with fuel consumptions recorded by the operators of both uninsulated and insulated commercial rubber driers.

EFFECT OF INSULATION ON OPERATING CONDITIONS

An insulated tunnel drier will have a lower temperature gradient along its length and this will be an advantage when a drier is operated batch-wise, i.e. when the trucks are not moved during the drying cycle, since the trucks at the two ends will receive more equal treatment.

For a tunnel operated semi-continuously in which a fraction of the trucks are loaded daily and progressively moved up the tunnel the effect of the reduced gradient is not likely to affect the drying of crepe, but for sheet rubber it is possible to visualise some instances when the maximum temperature of drying is limited by the tendency for blister formation at the cool end. In such instances the higher cool end temperature in an insulated drier, compared with that in an uninsulated drier working at the same hot end temperature, would lead to an increase in the tendency of the sheet to blister. The hot end temperature would therefore have to be lowered slightly to correct the position.

Calculations have shown that this lowering of the hot end temperature would reduce the output if a constant outside temperature were assumed. But if one takes into account that the outside temperature in fact varies between day and night, then it is possible to show that the average temperature throughout the drying cycle is very little different from that in an uninsulated drier: thus the outputs would be almost the same and the full economic benefit of the insulation would be obtained. The characteristic of insulated driers to react less to variations in the outside temperature produces an ancillary advantage in that a more uniform output is to be expected.

ECONOMICS

In the case of a single brick oil fired tunnel drier with an output of 4,000 lb/day of sheet at 140°F, 2,500 lb/day of thick crepe at 120°F, or 2,500 lb/day of thin crepe at 100°F, the extra capital required to raise the R value from 1.85 to over 10 would be about $2,500. The losses would be reduced by some 80% and the savings in fuel costs over 5 years would be $9,500 at 140°F, $4,200 at 120°F, and $2,000 at 100F°.

CONCLUSIONS

There appear to be definite advantages in increasing the level of insulation of oil fired driers above that usually employed for wood fired driers. The calculations show that, in the case of sheet, the extra capital involved in reducing the losses by 80% would be paid off in a little over a year by the savings in oil fuel costs. Thereafter there would be a saving of over 0.1 cent/lb of rubber dried. For the lower temperatures employed in crepe drying the savings are not so great but the economic balance is still in favour of insulation.

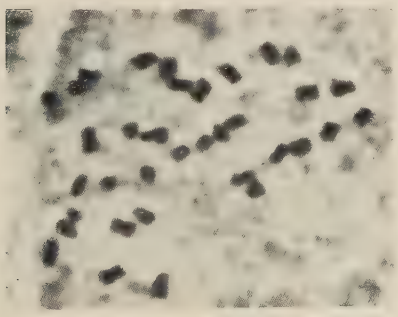
We would like to acknowledge the helpful discussions we have had with representatives of the General Electric Company (Malaya) Limited and Woods of Colchester Limited during the preparation of this article and also their help in providing data on costs of construction.

Chromosomes of Hevea brasiliensis

On page 22 of *Planters' Bulletin 40*, January 1959, there is a note on 'Rooted Clones' with a photograph of root development on a stem of clone PR 107.

Root tips were taken from this plant after it had been transplanted on its own roots. They were squashed and stained after pretreatment. The photograph, taken with a phase contrast microscope, shows part of a root-tip cell which contains thirtysix stained chromosomes, the normal number of *Hevea brasiliensis*. They are shown more clearly in the drawing. The magnification is approximately 2,000.

The method used causes shortening and thickening of the chromosomes and is primarily intended to make them easily countable, although it allows some comparison of shapes and sizes of the different chromosomes. It is effective only on cells which are in the process of division, when the chromosomes are ready to split longitudinally to furnish each of the two new cells with sets of thirtysix chromosomes. The 'pinched waist' or centromere which can be observed in some of the chromosomes in the photograph and is shown more clearly in the drawing, is the part of the chromosome



which controls its movements before, during and after division.

Very little is known of the genetics and cytology of hevea. By methods such as the one outlined here, a survey may be made of the chromosome numbers not only of parent clones used in the R.R.I. breeding programme, but also of trees grown from seeds subjected to special chemical treatments and to irradiation.

It is known that certain clones behave abnormally in producing pollen and that others are poor seeders. A study of the behaviour of their chromosomes may lead us to a better understanding of the processes involved, enabling practical use to be made of the variations in fertility that exist. For example, in a seed garden containing two clones, one known to yield no fertile pollen, only the male-infertile clone would bear cross pollinated seed: all seed from the male-fertile clone would be selfed and could be rejected on seed coat characteristics.

Effect of High Water Table on Growth of Tap Root

A striking example of the effect of a high water table on the growth of the tap root of rubber is seen in the illustration, page 48. Instead of the tapering tap root

that normally develops in a well drained soil, bulbous growths have developed at the end of each fork of the tap root. It

would appear that the root, on reaching the water table, grew back on itself in a spiral, forming a natural graft over which corky tissue has developed.

Control of Cockchafer Grubs in Young Rubber

Planters' Bulletin 26 contained an article on cockchafers with a brief reference in general terms to control measures. At that time our experience of cockchafers attacking rubber was not great as there had been no large scale outbreaks brought to our attention for many years. Work on their control had therefore not been possible. Since the publication of that article in 1956, cockchafer infestations in certain areas have been increasing and 1958 has seen some heavy attacks. The increased incidence has allowed methods of controlling the grubs to be studied and preliminary advice is now issued for treatment which will protect young rubber from severe injury. As we learn more about the habits of this pest our advice may require modification.

Three important species of cockchafer grubs attack rubber but recently the one most commonly encountered is *Holotrichia bidentata,* which is the species used for working out the method of control. However, there would appear to be no reason why the same treatment could not be used to control outbreaks of the other species.

The two insecticides aldrin and gamma benzene hexachloride have been found equally good for control of the grubs but the lower cost of the former, and its better persistence in the soil, make it a first choice. Other insecticides are under test and some of these may be included in our later recommendations.

For the protection of newly planted seedlings or stumps, and of the taproot and base of the laterals of young trees, the insecticide should be watered onto the soil round the collar within a radius of fifteen inches. Distribution is improved either by forking the soil to loosen it, or by making a number of holes, before the insecticide is applied. To treat effectively such an area, at least four pints of solution are required for each planting point. Where plants are large, the area of distribution may be increased to a radius of three feet, but a corresponding increase in the volume of insecticide applied must be made. A convenient method to employ at planting time, or when supplying, is to treat the soil used in the planting hole with the recommended four pints of solution. Aldrin should be used at a concentration of 0.1% (e.g. 1 in 200 Aldrex 2), and gamma benzene hexachloride at 0.04% (e.g. 1 in 500 Gammexane Emulsion Concentrate).

Estates Advisory Service

The Blackman Report contained recommendations in paragraphs 45 to 47 for the establishment within the R.R.I. of an advisory service for estates; that is for rubber growers classified, with statistical preciseness, as possessing 100 acres of rubber or more. During the past few months it has been possible to take the first steps in initiating the new service. The full changeover will take time and rubber planters will wish to know something of progress and intentions.

The present target for the estates advisory service is to provide advice on the practices and problems of planting and maintaining rubber trees and harvesting the crop, – the field of work of the Soils, Botanical and Pathological Divisions – excluding that portion of the Chemical Division's province which covers collection of latex. Progress is dependent on the speed of recruitment and the training, where necessary, of staff to undertake advisory duties.

Mr L.R. Davidson, formerly Advisory Officer, Soils Division, and later Smallholders' Advisory Officer, returned from leave in October 1958 as Head of the Estates Advisory Service. External operation commenced in December when the new organisation took over the advisory work of the Soils Division; that of the Botanical and Pathological Divisions is being undertaken as staffing permits.

The work in course of transfer from the Divisions is predominantly work for the larger categories of estate, principally for those over 1,000 acres. Concurrently the needs of the smaller class of estate for advice are being reviewed and staff recruited to build up appropriate advisory services for this group of estates.

Journal

Two contributions from members of the Pathological Division constitute Volume 15 Part 5 of the *Journal of the Rubber Research Institute of Malaya.*

The first, a paper by Mr F.W. Hutchison 'Defoliation of *Hevea brasiliensis* by Aerial Spraying', describes work undertaken between 1950 and 1956 to select a suitable defoliant and to study the possibility of applying this from the air to mature trees. The investigations were made in order to ascertain possible means of eradication should South American leaf blight disease ever be introduced into Malaya. A large number of materials were tested as defoliants and the n-butyl ester of 2,4,5-T was selected as the best. Trees sprayed from the air with a 5% solution in Shell Diesoline, at the rate of three gallons per acre, were successfully defoliated and kept free of leaves for a period of four to six weeks. A de Havilland Beaver aircraft was used.

The second paper, 'Pink Disease of Hevea Caused by *Corticium salmonicolor*' by Mr R.N. Hilton, gives an account of the present knowledge concerning pink disease. The work on pink disease carried out at Laikhê in Indochina over the last ten years is compared with results obtained at the R. R. I. Experiment Station at Sungei Buloh. The outcome of a country-wide survey on pink disease incidence is presented, and the absence of disease on coastal soils discussed. A coloured distribution map and photographs illustrating the life-history of the disease are included.

R. R. I. News

Mr W.J. Baulkwill arrived early in January to take charge of the Publications Section, including the Library. He graduated in Modern Languages at Oxford University, and subsequently took the National Diploma in Agriculture at Seale-Hayne Agricultural College.

Recently, Mr Baulkwill has been Librarian and Editor of Publications at the Grassland Research Institute, Hurley, Berkshire.

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Dr G.F. Bloomfield, a senior member of the staff of the British Rubber Producers' Research Association has been seconded to the R.R.I. for a liaison visit of about two months from 29 January 1959. Dr Bloomfield worked with the R.R.I. Chemical Division for two years, 1950 and 1951, on secondment from the B.R.P.R.A. and on his present visit he will work with members of the staff of the Chemical Division on plans for the development of an improved Technical Service to consumers of natural rubber.

Correspondence

MONKEY DAMAGE

We are pleased to publish two letters received in response to Mr C.W. Hart's appeal in Planters' Bulletin 40 for information on the control of monkeys. We believe that the experience of these two planters will prove valuable to our readers – Editor.

'With reference to the correspondence on this subject, I have found that the Loosco carbide gun is effective in keeping monkeys away, provided that periodically the Estate Hunters shoot a few and hang the corpses on the fence very near to the Loosco. The monkeys seem to associate the Loosco report (and it is very similar to that of a shotgun) with the fate of their brothers.

Secondly, I consider it important that the Loosco is kept in operation over twentyfour hours, and this is possible on one fill by using white carbide.'

Bukit Kledek Estate

S. Morrison

Manager

o

'To protect young nurseries against damage by monkeys I usually have one or two big monkeys shot, white-washed and hung on a 12 feet high pole in the nursery where the bodies are visible from all sides. As a rule it will keep monkeys away.

It may be possible to use the method on a bigger scale along the jungle boundary of a replanting. The problem then may be to shoot enough monkeys. It may help to have it done on a piece rate basis.'

Sadang Estate

J. Verseema

Manager

Replanting on Smallholdings

First published in 1955, *Replanting on Smallholdings* was revised, amplified and reprinted in 1958. There are sections on Site, Planting and Maintenance and appendices on Budgrafting, Nurseries, Fungicides and Insecticides. Copies are available price $1 post free in Malaya.

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Bacteriological Tests on Latex

Estates or factories interested in forwarding samples of latex to the R.R.I. for bacteriological examination, should ensure that the samples are taken under conditions as near sterile as possible. It is normal to use sterilised bottles to hold the samples and we would be pleased to supply, on request, containers suitable for the purpose. It is also necessary that the bottles should be quite full and that sterile stoppers are used for sealing.

OUR COVER SHOWS PILES OF FELLED RUBBER TREES BEING BURNED DURING PREPARATIONS FOR REPLANTING.

Photo C.G.A.

The Standard Engravers & Art Printers, 63 Campbell Road, Kuala Lumpur, Selangor